

REMARKS

Claims 1-24 are pending in this application. No claims have been added nor have any claims been withdrawn. Therefore, after entry of this Amendment, claims 1-24 are still pending.

Claims 9-24 have been allowed. Applicant wishes to thank Examiner for the allowable subject matter.

Claims 1-8 are rejected. Applicants respectfully traverse these rejections. Reconsideration and withdrawal of the outstanding rejections are respectfully requested in light of the following remarks.

Claims 1-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over LENK (US 6,222,352) in view of LU (US 5,715,153). These rejections are respectfully traversed.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaect*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 - § 2143.03 for decisions pertinent to each of these criteria.

The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed

invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). See MPEP § 2144 - § 2144.09 for examples of reasoning supporting obviousness rejections.

A disclosure in the prior art that teaches away from, or discourages, the making of the claimed invention undermines *prima facie* obviousness. *In re Sponnoble*, 405 F.2d 578, 587 (C.C.P.A. 1969); *In re Caldwell*, 319 F.2d 254, 256 (C.C.P.A. 1963). A reference teaches away "when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)

In rejecting the claims, the Examiner wrote that "[I]t would have been obvious to one skilled in the art at the time of invention to have modified the single-inductor dual output buck converter to have the converters arranged in cascade thus gaining greater flexibility in the distribution of power (col4, line 41)." The Examiner cited the motivation to combine LU with LENK as "gaining greater flexibility in the distribution of power (LU col 4, line 41)."

The application expressly stated in the application the problem to be solved as, *inter alia*:

[0006] Single output buck converters work well in applications and/or devices that employ a single input voltage. However, some applications and/or devices utilize two power sources. For example, a digital signal processor (DSP) generally employs two power supplies; one power supply (1.8V) is to power an I/O ring and the other (1.2V) is to power a digital core. Dual voltage outputs of the power converter are also reported to reduce power dissipation. Two single output buck converters can be employed in such instances, but at a relatively high cost in terms of power utilization, area utilization, and component costs. Typically, inductors are the highest cost component and employing two buck converters results in requiring two inductors. Additionally, more switches are then employed, which can result in greater power consumption.

[0007] What is needed is power supply system that supplies two output voltages, yet is relatively low cost compared with using multiple single output buck converters.

Applicants even noted the shortcomings of the prior art in the present application.

[0031] Traditionally, dual voltage outputs can be implemented with two separate dc-dc buck converters as shown in FIG. 3. However, the inventors of the present invention note that the implementation in FIG. 3 requires two inductors, which are costly in price and area, and, as a result, the implementation in FIG. 3 is not cost-efficient.

[0032] Another approach to providing dual output voltages is to use a single inductor dual output voltage converter. FIG. 4 is a schematic diagram illustrating one such prior art single inductor dual output converter. This converter consists of one inductor, four power switches, and two output filter capacitors. However, the inventors of the present invention note that in every operation stage, there are two power switches in series, and thus, the efficiency of this buck converter is diminished. It is also noted that this buck converter employs four switches, which consumes more silicon area. Another prior art single inductor dual-output converter implementation is shown in FIG. 5. This implementation can provide negative voltages, positive voltages, or positive and negative voltages. However, the inventors of the present invention note this implementation, similar to that of FIG. 4, does not have a good efficiency because there are two power switches in series during each operation stage. For dual output voltages, this implementation in FIG. 5 requires even more switches than that of the converter of FIG. 4.

The Fig. 4 used by Applicant's to describe the prior art is a schematic diagram illustrating the buck convertor of LENK. The LENK reference was provided to Examiner in an IDS for this application. One of ordinary skill in the art would not look to LU to solved the problem of the present application. The LENK reference teaches away from have the converters arranged in cascade:

If more than one output voltage was required, either a linear regulator at the output of the buck converter, a second buck converter at the output of the first converter, or a parallel buck converter was required. Using a linear regulator, although low cost, involves very poor efficiency and concomitant heat problems. Use of a second buck converter or a parallel buck converter both involve adding one or more additional complete converters, with all of their additional magnetics, controller integrated circuits, etc. Further, the series connection of two frequency converters may halve the efficiency of the system. (LENK: Col. Lines 26 to 36).

Therefore, to one of ordinary skill in the art would not combine the teachings of LU with LENK. Accordingly, claims 1 to 8 cannot be rendered obvious in view of the combination of cited references.

In light of the above, it is respectfully submitted that the present application is in condition for allowance, and notice to that effect is respectfully requested.

While it is believed that the instant response places the application in condition for allowance, should the Examiner have any further comments or suggestions, it is respectfully requested that the Examiner contact the undersigned in order to expeditiously resolve any outstanding issues.

Respectfully submitted:

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